Positive Train Control (PTC) Working Group
Data & Implementation Task Force Meeting October 21, 1998
St. Louis, Missouri

- Dean Hollingsworth opened the meeting by asking the group for comments on the minutes of the September meeting. There were no comments and the group voted to accept the minutes.

- Mark Jones reported on yesterday's PTC/ITS meeting. Work is to be sent to Mr. Jones by October 30. He will send draft report back to team by November 6. The team will review and comment. The team will act on report at November 16, 2 p.m. meeting.

  Item points of his discussion are incorporated into this document as **Attachment No. 1.**

- Dean Hollingsworth reported on the Accident Review Team meeting of October 20, 1998. The ART reviewed 167 accidents and included 7 in the CRAM II database. The next meeting of the Accident Review Team is set for November 16 at 1 p.m. in Jacksonville, Florida.

- Frank Roskind reported on Economics Team meetings of September 26, 27, and October 20, 1998. The Team has agreed on Task Statements for the first three tasks assigned to the Team, and has agreed to accept that Task 1, inputs to the Corridor Risk Assessment Model (CRAM), is the first priority. The Team has agreed on values for Fatalities and Injuries, and is working on other issues. The largest factor will be equipment damage, so the Team is being very careful addressing that issue. Other issues are not as important in the CRAM, but may affect the railroads in other areas, such as in litigation, so they are subject to contention beyond their importance in this task. The Team has scheduled meetings in November (Washington, DC), December (New Orleans, LA) and January 1999 (Washington (DC).

- Ted Bundy reported on the PTC Glossary of Terms & Definitions and an open discussion ensued. Jim Stem made a suggestion that the group adopt a professional attitude to promote our industry in a professional manner and he would reflect those attitudes in our debate. Howard Moody made a suggestion that he thought both groups should meet together to discuss the Glossary of Terms & Definitions and the Congressional Report and asked "How are we going to use this glossary"?

  Mr. Bundy indicated that the glossary was going to be used in the Report to Congress and also indicated that the glossary given to the PTC Standards Task Force would be a subset of that glossary, defining the terms that they needed for regulatory purposes. Dick Kimball asked that once the Report to Congress is completed that we only use the glossary and extract those terms used in the report. Tim DePaepe indicated that there were conflicts and a disconnect in the different glossaries and no key to the sources of the glossaries, especially the IEEE version. Mr. Moody again asked if there would be a joint meeting for Standards and Implementation to discuss the glossary. Grady Cothen stated that he is hesitant to bring the groups together but if the group feels that we need to do it then we would have the meeting in November. Mr. Moody requested a 10 minute management caucus.

- Mr. Moody reported on the caucus. Management's concerns are that the glossary should be a reference document to obtain a term without having to reinvent on their own. We do not want to reinvent the wheel and make sure that this is a structured process. If a meaning is already in the FRA regulations then we need to adopt that definition. A stand-alone glossary, pertaining only to the Report, should accompany the Report and not the full glossary. Mr. Cothen stated that one of the specific tasks of the group is to develop current PTC definitions and capabilities, and hopes that everyone would recognize that in order for Standards to complete their process they need these defini-

tions. He went on to say that the definitions needed for the work of the Implementation Task Force would have some potential differences. We should have a document to be used for a variety of processes, but at this point we need to go forward, given the amount of time for the report. Mr. Moody stated that we need to be more careful, that we should go with one term and not define it differently and come up with a new term. The groups need one glossary.

- Mr. Bundy discussed the Draft Glossary - PTC Standards Task Force. Mr. Moody indicated that Mr. Bundy has answered all his (management's) concerns except the question of "How to we get there from here?" It was agreed that the name of the working document is PTC-Glossary of Terms and Definitions and the electronic filename is **"Glossary.wpd, glossary.doc, and/or glossary.rtf** (representing the three different file formats of the same document. Mr. DePaepe requested that the draft glossary prepared by the BRS be incorporated into the master document, and Mr. Bundy stated that he would do this if Mr. DePaepe would e-mail the document to Ms. Hall and himself. Mr. DePaepe stated that he would do this.

Bob Dorer indicated that in all places that reference his name, then his name be replaced by **NASA Software Safety Standard, NSS 1740.13**. Mr. Bundy requested that Tim DePaepe rework his glossary to eliminate the terms in which there are no definitions and FRA will use the definition that we currently have. Mr. Moody indicated that he would work on the IEEE glossary and convert it to Word format. Ted Bundy indicated that he would add a key to the glossary, showing how the members should use it. The two glossaries (PTC - Glossary of Terms and Definitions and the IEEE glossary) will be emailed to the group and they will independently take a look at them prior to the November meeting.

- Mr. Bundy then continued leading a discussion of the Draft Glossary - PTC Standards Task Force. The final Draft Glossary - PTC Standards Task Force **(Document No. WG-Oct-59, Attachment No. 2 of this document)** was stopped at 1:30 p.m. and will continue later in the day.

- Dick Stotts gave a presentation on the PTC Systems Capabilities, using a draft matrix that he has under development. Mr. Stotts will work on the draft, and make a more formal presentation at the November meeting. Jim Stem made a statement that the Matrix shows that none of the 10 systems have submitted PTC Operating Rules to FRA for approval. Mr. Cothen indicated that we need a Operating Rules Team from this group to produce descriptive language that will go into the Report to Congress and be used as a resource document for railroads to use when drafting appropriate Operating Rules for PTC systems, and integration of those systems to include equipped and non-equipped trains.

The following will be members of the PTC Operating Rules Team to develop a scoping document:

Rich McCord - FRA
Ted Bundy - FRA
Jim Stem - Labor
Doug Horstman - Labor
John Vogler - Commuter Railroads
Bob Pugmire - UPRR (name submitted by Howard Moody via e-mail on 10/26/98

The group took a 15 minute break and decided to return to the Draft Glossary.

- The group continued the discussion on the Draft Glossary - PTC Standards Task Force. The **new** Draft Glossary, as referenced earlier in these minutes, is incorporated into this document as **Attachment No. 2.**

- Howard Moody stated that the Railroad's Operating Team Members would consist of one representative. The two issues of the PTC Operating Rules Team are:

  - Complete PartVI, Section E, Items 2 and 3 of the Secretary's PTC Progress Report to the Congress—Outline for Discussion by the Implementation Task Force, and;

  - Define issues

- Dr. Sherry Borener gave a preliminary CRAM II presentation to be discussed in further detail at the November meeting.

- Ted Bundy discussed the distribution of the minutes and other computer generated documents for the Data & Implementation Group through the VOLPE Center. The group voted on having VOLPE publish the Data & Implementation Group's minutes, attachments, and other working documents on their website - **http://204.166.190.40** with user ID of **rsac,** and password of **rsac.** ID and password will **not** be case sensitive.

- Grady Cothen discussed the Secretary's PTC Progress Report to the Congress—Outline for Discussion by the Implementation Task Force, which is incorporated into this document as **Attachment No. 3**. There were changes in the outline based on a conference call between Grady Cothen, Howard Moody, James Stem, Ted Bundy, and Gary Pruitt from ARINC. Mr. Cothen brought these changes to the attention of the task force. The changes were made by ARINC, and any references to "Commentary:" in the revised outline were drafted by them.

Meeting adjourned at 5 p.m.

Attachment No. 1

PTC/ITS REPORT OUTLINE

1. Problem of grade crossing safety.

- Discuss Items 1-7 and 9 of December 17, 1997 highway-rail grade crossing report.

FRA (Mark Jones)

2. PTC/ITS applications that can affect grade crossing safety. (i.e., Long Island Railroad Atlas, Minnesota Guidestar Project, School St. four quad gates, Michigan ITCS project, Illinois project)

FRA (Mark Jones), TTI (Les Olson), CANAC (Bill Moore Ede)

3. Future technologies that could impact crossing safety (i.e., seasonal motor vehicle traffic at grade crossings).

TTI (Les Olson)

4. Need for standards. (Rail labor and management involvement, FHWA, AASHTO, AAR, APTA). Standards should include procedures necessary for maintenance, inspection, and testing of PTC functions that affect highway-rail grade crossing safety.

FRA (Tom Woll), BRS (Tim DePaepe), IBEW (Robin Buxton), AAR (Bob Gallamore)

5. Critical issues that must be addressed:

- Need for intermodal interoperability.
- Railroad right-of-way that ensures train movement priority.
- Delineation of railroad industry responsibility vs. ITS community responsibility.
- Communication availability issue - Band Width.
- Liability Issues (Railroads, Railroad Employees, and Suppliers.
- Change in Railroad personnel responsibilities for providing warnings to motor vehicles and operating rule implications.
- Consistent/Universal definition of “fail-safe” situation.
- FRA standards for positive crossing protection to rail passengers and operating employees.

FRA (Tom Woll), BRS (Tim DePaepe), IBEW (Robin Buxton), AAR (Bob Gallamore)

Work to be sent to Mark Jones by October 30. Mark will send draft report back to team by Nov. 6. Team will review and send comments back to Mark. Team will act on report at November 16, 2:00 p.m. meeting.

Key:

- Terms & Phrases that are ***both bolded and italicized*** are those for which definitions were requested by the PTC Standards Task Force.
- Terms & Phrases that are **bolded only** were not requested by the PTC Standards Task Force, but are included because they were deemed helpful and/or significant by the PTC Implementation Task Force.
- Glossary Reference Sources are shown in ***bolded and italicized*** text at the end of each defined term or phrase. Those denoted with a number in parentheses are referenced at the end of the document. This listing is from a more comprehensive glossary, and includes sources for definitions that are not included in this subset.

Advanced Train Control Systems (ATCS) - A microprocessor/communications/transponder-based system designed to provide both safety and business functions. Safety area capabilities are: (1) the digital transmission of track occupancy/ movement authority to trains and an acknowledgment from the train crew via digital radio communications in lieu of voice communications, (2) provision of positive train separation control functions to preclude the train from exceeding its assigned limits of authority, (3) protection for maintenance-of-way and other workmen on track, (4) enforcement of authorized operating speed limits for trains consistent with civil engineering and other operating constraints, including temporary slow orders. In the business-related function area, ATCS was designed to enable the transmission of work order activity related to pick-up and set-out of rail cars, locomotive health reporting, and other functions. ATCS was a joint program of the AAR and RAC. ***PTC Implementation Task Force***

Axiomatic Safety Critical Assessment Process - **Back to Standards TF**
Assessment - To carefully ascertain the value of a system or process. ***Bundy – Webster's?*** **(Standards TF - see Safety Critical on appropriate page of this document...recommend you use Webster's definition of axiomatic)**

Audit Process - **Back to Standards TF - see definition of Audit, below**
Audit - An independent examination of a work product or set of work products to assess compliance with specifications, standards, contractual agreements, or other criteria. ***(1)***

Civil Speed Enforcement - Standards TF - see below.
Civil Speed - The maximum speed allowed in a specified section of track or guideway as determined by physical limitations of the track/guideway structure, train design, and passenger safety. ***(PTC Implementation TF)***

Core Functions - **Standards TF - MUST be Core Features, not Functions**...see below
Core Features of PTC - To: (1) Prevent train-to-train collisions (positive train separation); (2) enforce speed restrictions, including civil engineering restrictions and temporary slow orders; and (3) provide protection for roadway workers and their equipment operating under specific authorities. ***PTC Working Group***

Design for Verification and Validation - **Standards TF - see definitions on appropriate pages of this document.**

Documentation Procedures - **Standards TF to define.**

Duly Authorized Persons - **Standards TF to define.**

Human Factors - A multi disciplinary effort to develop information about human capabilities and limitations and to apply this information to equipment, systems, facilities, procedures, jobs, environments, training, staffing, and personnel management for safe and effective human performance. ***GAO – RCED-98-7***

Human Factors Requirements and Concept - **Standards TF to define.**

Human-machine Interface **- Standards TF to define.**

Implementation and Initial Test Procedures **- Standards TF to define.**

Incremental Verification and Validation **- See definitions of verification & validation on appropriate pages of this document.**

Initial Design Methodology **- Standards TF to define.**

Initialization Tests **- Standards TF to define.**

Maintenance and Periodic Testing **- Standards TF to define.**

Material Handling **- Standards TF to define.**

Minimum Safety Standards **- Standards TF to define.**

Modification **- Standards TF to define.**

Modify / Upgrade / Revise / Add or change functionality / Expand / Decommission **- Standards TF to define.**

Operational Testing **- Standards TF to define.** ***(Note from T. Bundy: suggest that you make reference to the requirements set forth in 49 CFR Part 217.)***

Performance Standards **-** The objective and measurable outcomes that a system or component must achieve. ***(PTC Implementation TF)***

Positive Train Control (PTC) - A generic term (and acronym) used to describe any processor-based system of train control that will: (1) Prevent train-to-train collisions (positive train separation); (2) enforce speed restrictions, including civil engineering restrictions and temporary slow orders; and (3) provide protection for roadway workers and their equipment operating under specific authorities. ***PTC Implementation TF***

Positive Train Separation **(PTS)** - This term was initially coined by the National Transportation Safety Board (NTSB) to describe any system of train control that will prevent train-to-train collisions. The term is employed by the Union Pacific Railroad and Burlington Northern Santa Fe Railroad to denote a test program for positive train control on certain of their lines in the States of Oregon and Washington. ***PTC Implementation TF***

Positive train separation - One of three core features of a PTC system. ***PTC Implementation TF***

Processor Based Safety-Critical Train Control Systems **- Standards TF to define.**

Processor Based Train Control Systems **- Standards TF to define.**

Railroad Procedural Compliance **- Standards TF to define.**

Revision Control **- Standards TF to define.**

Roadway Worker Protection **- Standards TF to define.** ***(Note from T. Bundy: suggest that you make reference to the requirements set forth in 49 CFR Part 214.)***

Safety - Freedom from those conditions that can cause death, injury, occupational illness, or damage to or loss of equipment or property, or damage to the environment. ***IEEE Draft***

Safety of a System {Safety, S(t)} - The probability that a system will either perform its functions correctly or will discontinue its functions in a manner that does not disrupt the operation of the other systems or compromise the safety of any people associated with the system.

Safety Critical - A term applied to a system or function, the correct performance of which is critical to safety of personnel and/or equipment; also a term applied to a system or function, the incorrect performance of which could cause or allow a hazardous condition to exist. ***PTC Implementation Task Force***

Software - Computer programs, procedures, rules, and possibly associated documentation and data pertaining to the operation of a computer system. ***(8)***

Technology Requirements and Concept **- Standards TF to define**

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Verification and Validation

Validation - The process of determining whether the system or component complies with the objectives and system requirements during and/or at the end of the development cycle. That is... "did we build the right system?" ***PTC Implementation Task Force***

Verification - The process of determining whether the system or component outputs of a given phase of the development cycle fulfill the requirements established at the start of that phase. That is... "Did we build the system correctly?" ***PTC Implementation Task Force***

Glossary Reference Sources

1) IEEE Std 610.12-1990, Standard Glossary of Software Engineering Terminology, Institute of Electrical and Electronic Engineers, December 10, 1990.

2) Association of American Railroads Signal Manual, Section 1 - Administration, Association of American Railroads, 1991.

3) IEEE Std 1012-1986, IEEE Standard for Software Verification and Validation Plans, Institute of Electrical and Electronic Engineers, November 14, 1986.

4) Lewis, Robert G., Miller, Luther S., Welty, Gus, Ellsworth, Kenneth G., Flagg, Mason B., Railway Age's Comprehensive Railroad Dictionary, Simmons-Boardman Books Inc., 1984.

5) A Glossary of Transit Terminology, American Public Transit Association, September 1984.

6) Glossary of Reliability, Availability and Maintainability Terminology for Rail Rapid Transit, American Public Transit Association, February 1978.

7) MIL-STD-721C, Notice 1, Definitions of Terms for Reliability and Maintainability, Department of Defense, October 23, 1991.

8) FIPS PUB 101, Guideline for Lifecycle Validation, Verification, and Testing of Computer Software, U.S. Department of Commerce, National Bureau of Standards, June 6, 1983.

9) RW-MSB, High-Speed Maglev Trains; German Safety Requirements, English Translation published by FRA/VNTSC/RSPA, Report No. DOT/FRA/ORD-92/01, January 1992.

10) RTCA/DO-178A, Software Considerations on Airborne Systems and Equipment Certification, Radio Technical Commission for Aeronautics, March 1985.

11) Dictionary of Public Transport, 1st Edition, Unikon Internationale des Transports Publics (UITP), 1981.

12) Ellsworth, Kenneth G., The Car and Locomotive Cyclopedia, Fifth Edition, Simmons-Boardman Books Inc., 1984.

13) MU 8004, Principles of Technical Approval in Signalling and Communication Engineering, Section 30 050, German Federal Railroad, Federal Railroad Main Office, Munich, January 1, 1992.

14) Glossary of Urban Public Transportation Terms, Special Report 179, Transportation Research Board, National Academy of Sciences, Washington, D.C., 1978.

15) Automatic Train Control in Rail Rapid Transit, United States Congress, Office of Technology Assessment, May 1976.

16) Software System Safety Handbook, AFISC SSH 1-1, Headquarters Air Force Inspection and Safety Center, September 5, 1985.

17) MIL-STD-882B, Notice 1, System Safety Program Requirements, Department of Defense, July 1, 1987.

18) Luedeke, J., Thompson, R., Evaluation of Concepts for Safe Speed Enforcement, Battelle Final Report, April 3, 1992.

19) Edelman, Sheldon, "Glossary of Microprocessor-Based Control System Terms", Instruments and Control System, May 1979.

20) System Safety Glossary, U.S. Department of Transportation, Transportation Systems Center, June 1986.

21) MIL-STD-1574A, System Safety Program for Space and Missile Systems, Department of Defense, March 15, 1977.

22) Interim Defence Standard 00-55, (Draft), Ministry of Defence, May 1989.

23) Webster's New Collegiate Dictionary, G&C, Merriam Company, Springfield, MA, 1979.

24) Guidelines for Chemical Process Quantitative Risk Analysis, Center for Chemical Process Safety, American Institute of Chemical Engineers, New York, 1989.

25) De Marco, T., Structured Analysis and System Specification, Yourdon, New York, 1979.

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Secretary's PTC Progress Report to the Congress—

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Outline for Discussion by the Implementation Task Force

NOTE: The immediate task before the Working Group is preparation of its own report to the Administrator. Preparation of the report in a format suitable for use as a progress report to the Congress will assist FRA is meeting its statutory responsibilities. The Administrator will review the report to ensure that it represents Administration policy. The Office of the Secretary of Transportation, with review by the Office of Management and Budget, will have final approval of this report. FRA seeks assistance from the PTC Working Group in developing this report *and will clearly distinguish in the final Report to Congress any material approved by the RSAC from any material not approved by the RSAC.*

<u>Executive Summary</u> in Front *(FRA will do, Grady Cothen - point of contact)*, then:

I. Introduction: The Concept of Positive Train Control (safety functions and other functions as conceived in industry efforts, such as ARES and ATCS) *(FRA will do, Grady Cothen - point of contact))*

<u>(Note: All Commentary in this document added by ARINC)</u>

Commentary: Needs to introduce basic rail transportation terminology, such as types of territory, density of operations, etc.

II. Recap: 1994 Report and Action Plan *(FRA will do, Grady Cothen - point of contact))*

III. PTC architectures *(RSAC Progress Report Group, [points of contact are Chuck Dettmann, Grady Cothen, and James Stem until team make-up has been determined])*

A. Train control systems and allied technologies [explain similarities and differences between train control systems and other technologies than address one or more PTC functions]

Commentary: Add introduction of how technology has enabled advancements in safety and efficiency of operations. Add some history; e.g., describe traditional signaling technology (Possibly extract portions of Bob Gallamore's article in Railway Age). Discuss proven safety record, fail safe concepts, closed loop, cab signals, and PTC concepts. – Need to be sure it doesn't duplicate information presented in Section I. Some of this material is in the 1994 report.

Should compare different systems based the system functional elements (location system, communications, operator display, how/where safety problem is identified, how system reacts to detected problem). Should discuss how different systems address different risk areas and achieve different levels of risk reduction.
Possible areas in which systems may differ: approach to monitoring and detection, processing, prevention, actions taken.

III. B. Current system concepts

Commentary: Should cover the following topics:

- _ *Primary characteristics of train control systems [open loop vs. closed loop, safety concepts, types of hazards being protected against*
- _ *Basic technology elements [GPS, datalink, advanced braking systems, etc.]*
- _ *Current technology and systems*
- _ *What is being tested*
- _ *What is being installed*
- _ *European communications based train control [functions, development status, issues, problems]*
- _ *Cost tradeoffs of US vs European train control systems [e.g., differences in mix of freight vs passenger traffic, differences in train density, subsidization]*

- _ *Transit industry communications based train control (functions, development status, issues, problems)*
- _ *Future directions in PTC technology*
- _ *Technology and implementation challenges*
- _ *The descriptions should include annotations of their primary characteristics (open-loop, closed-loop, safety concepts, etc.)*

1. U.S. railroad projects [compendium] - *(Howard Moody)*

2. Supplier approaches [supplier survey]

3. Northeast Corridor systems - *(Howard Moody)*

C. Safety-relevant differences among system concepts *(Stotts Matrix can be used as a working document)*

Commentary: Discuss control concepts:

- _ *Warnings (including proximity warning)*
- _ *Open-loop control*
- _ *Closed-loop with human in the loop control*
- _ *Closed-loop with machine in the loop control*

To include information from matrix from Dick Stotts.

IV. Risk reduction potential *(RSAC Progress Report Group, [points of contact are Chuck Dettmann, Grady Cothen, and James Stem until team make-up has been determined])*

Commentary: The point should be made that trying to address all possible risk areas leads to an inability to ever settle on the system requirements. It's better to address the primary risks and achieve incremental safety improvements. The issue of incremental improvement of safety also includes the issue of equipping the territories and the locomotive fleet; therefore, the issue of handling unequipped trains is part of the implementation strategy.

A 100% risk reduction cannot be assigned to any individual risk countermeasure. Achieving safety is a combination of risk reduction strategies, targeted at specific safety concerns.

IV. A. Core functions / possible auxiliary functions (more details on new peripheral devices such as wash-out monitors/alerters, etc.?) [*Standards Task Force*]

- _ Core functions and possible additional functions
- _ Address the concept of hazard targets and discuss how the PTC architecture will accommodate integration of other hazard detectors to address territory-specific hazards (washout, bridge alignment, grade crossing detectors, etc.) as they are justified.
- _ Illustrative levels of functionality [ART 4-level construct] *(Need more clarity from ART Team).*
- _ Address interoperability and safety impact - *(Standards Task Force)*
- _ Risk reduction potential (from Dr. Giras material) - *(Standards Task Force)*
- _ Importance to safety of passenger rail service - *(Fran Hooper)*
- _ Similarity of freight and passenger safety objectives (core functions) - *(Probably taken care of by bullets 1, 2, & 3)*

- ITS/PTC interface and highway-rail crossing safety (and any other intelligent transportation systems?)(Narrative discussion that describes the ITS interface and how it could relate/interface with PTC architectures…build on Louisville Report??)((There is a report done in Canada that Bill Moore Ede of CANAC can/will provide)) *(PTC ITS Team [Mark Jones - point of contact, Hollingsworth, Moody, Buxton, DePaepe, Horstman, Inclima, Hooper, Travis, Sniffen, Nofsinger, Roop, Hubbell ,Tom Woll]*
  - Note: This team will also deal with wayside detector issues, and will be the recipient of the RF Report.

B. Preventable collisions, derailments, and casualties at different levels of functionality [Summary ART data] (& narrative report goes here) *(PTC - ART [Hollingsworth, Bush - point of contact, McCord, Stotts, Ralph, Moody, Milhon, Moller,, DePaepe, Newman, Inclima, Stem]*) *(Unify with A, bullet #3)*

C. Risk as a function of salient variables [executive-level summary of CRAM II results and evaluation of significance] *(FRA and Volpe will do, delivery @ Nov. Meeting)*

Commentary: Discuss CRAM model approach and results. Address problems of prediction with infrequent events. Introduction of model should address the limits of its applicability and a discussion of what it does/does not address)

D. Potential roles for systems with limited functionality [e.g., proximity warning concepts] and the challenge of light density lines [*ART*] *(Bob Ralph & Larry Milhon)*

Commentary: Address issue of forward compatibility as evaluation criteria for limited functionality systems; e.g., can system be upgraded to provide the core functions? Limited functionality systems may be used where full PTC is not justified, and they provide incremental safety improvement even if they do not meet all of the PTC core objectives.

V. Costs and Benefits of PTC systems (*PTC Economic Team [Lynn Jarrett, Milhon, French, Roskind - point of contact, Ditmeyer, Newman, DePaepe, Clifford, Labor Economist TBD, 2 representatives from APTA TBD, FRA Accident Investigative Person, ATK representative?]]*

Commentary: The discussion of costs versus benefits should address the following points:

- ***Neither costs nor benefits should be double counted***
- ***Systems built to achieve business benefits may offset some PTC costs (e.g., datalink), but the value of the benefits are not attributable to PTC.*** *(Roskind to discuss with Gary Pruitt)*

VI. Development and deployment of PTC systems (*RSAC Progress Report Group, [points of contact are Chuck Dettmann, Grady Cothen, and James Stem until team make-up has been determined]]*

A. Interoperability *(PTC IDOT Project will address this issue as an early priority and try to deliver a report that can be used) (Moody & Gallamore)*

B. Safety performance standards *(Glean data from PTC Standards TF)*

Commentary: Address RAM-S (Reliability, Availability, Maintainability, and Safety) standards that are used to define performance requirements.

C. Radio navigation tools [DGPS] *(FRA will provide report to the steering group) (Shamberger - FRA-ROV)*

D. Radio frequency spectrum / management and utilization [refarming, APCO 25, etc.] *(NARRN, reporting through the ITS/Wayside Detector Team) (Moody)*

E. Deployment Issues

1. Demonstrate commercial reliability and viability (i.e., does the system work in revenue service?) *(FRA)*

2. Resolve interoperability in service, e.g. -Define and execute hybrid methods of operation: determine operating rules appropriate to handle unequipped trains & on-track equipment. Define strategies for handling unequipped trains and discuss how this impacts deployment. *(Operating Rules Team)*

3. Resolve intraoperability issues, e.g. -Define and execute hybrid methods of operation: determine operating rules appropriate to handle unequipped trains & on-track equipment - *(Operating Rules Team)*

40 Achieve scale of implementation necessary to return benefits - *(FRA)*

F. Program Elements (pilot program, testing, models, simulation tools, etc.) - *(ARINC)*

VII. Other communications, command and control requirements for the 21st Century: potential role for PTC systems (RSAC Progress Report Group, Lindsey to provide white paper on core infrastructure platforms / gateways)

A. Efficiency-related attributes of available architectures

__ Communications infrastructure - (existing documents from PTC presentation by GE-Harris)

__ Potential interface with CAD / traffic planners

__ Flexible blocks

Commentary: Need to look at GE-Harris report that addresses these features.

B. Implications for traffic, information and asset management, system capacity, service quality and profitability [including discussion of the extent to which the National rail system is capacity constrained or is expected to become so within the next 2 decades] - *(Economics Team)*

C. Intermodal considerations and transportation externalities

__ Growth of time-sensitive traffic - *(FRA Policy, Bob Ralph)*

__ Importance of privately owned freight railroads to efficient movement of goods - *(FRA Policy, Bob Ralph)*

__ Conservation of energy and protection of the environment (FRA Office of Policy Studies, Summary of..)

__ Future of railroads as hosts to commuter and high-speed intercity passenger service - *(Fran Hooper)*

D. Alternatives to PTC technologies

E. Other-than-safety benefits to the industry and the remainder of our society from PTC systems: estimates [potential future benefits that will not be realized using alternative technologies]

__ ARES Harvard Business Case

__ PB (Parsons Brinckerhoff) short corridor study

__ Transportation externality studies for freight: how can they be applied?

__ Commercial Feasibility Study (high-speed rail)

Appendices:

A. Glossary [start with terms from 1994 report, Sec. 17 AAR S&TC, other sources as appropriate]

B. Final Report: Corridor Risk Analysis Model [Include summary of views regarding usefulness of results.]

C. ?

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